

AMATEUR SATELLITE REPORT

AMSAT's Newsletter for the Amateur Space Program.



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Editor: Vern Riportella, WA2LQQ
Contr. Editor: Harold Winard, KB2M
Managing Editor: Bob Myers, W1XT
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Short Bursts

- The QSL address for the DP0SL ham-in-space mission is:
DARC DP0SL Activity
Postfach 1155
Lindinalle 6, D3507
Baunatal 1
Federal Republic of Germany
- The operating schedule of AO-10 will remain unchanged for the present. Battery condition is stable and favorable. Watch the AO-10 beacon for early word on any changes in the operating schedule contemplated.
- RS-5 and RS-7 will continue in eclipse through early December. The eclipses have caused the operating schedule of both these satellites to be sharply curtailed and largely unpredictable. The eclipse series for RS-5 ends December 14 while that for RS-7 ends December 11. Meanwhile, RS-8 continues to be in serious condition and may not return to service.
- The next North American Teleconference Radio Net (TRN) will be held at 0100 UTC on December 13. Featured speaker will be Paul Rinaldo, W4RI, QST Editor. Paul will speak on ACSSB and its potential and applications for Amateur Radio and satellites.
- AO-10 engineers and controllers have noted an increase in the quantity of errors being processed and corrected in the satellite computer known as the Integrated Housekeeping Unit or IHU. The situation is being closely monitored and is not presently a source of major concern. A so-called "hard-error" as contrasted to a "soft-error" is one that is constant and may indicate a cosmic ray impact in memory. The software used is designed to accommodate these types of "hits" and no serious consequences are expected if the number of errors detected remains reasonably constant.
- JAMSAT has donated \$5,000 to AMSAT for the Phase 3C project. JAMSAT's President Harry Yoneda, JA1ANG, presented the check to AMSAT at the Annual Meeting November 9. Harry is also an AMSAT Director.

New RS Satellites Expected Soon

Usually reliable sources in Europe predict the launch of RS-9 and RS-10 early in 1986. February is most-often cited as the likely time frame according to G3IOR who quotes

UA3CR. Both satellites will be placed in a low earth orbit similar to all prior RS's, that is, a polar orbit with a period approximating 120 minutes so as to approach sun-synchronicity. RS-9 has been experiencing some test difficulties but, if these diversions are overcome, it will be launched together with RS-10. RS-10, on the other hand, is said to be in excellent condition within its test regime, and should soon be shipped to the launch facility for integration with the launcher.

RS-9 will be quite similar to RS-1 and 2 with a Mode A transponder only. The big surprise is RS-10 which will probably carry 3 transponders. In addition to the now-traditional RS Mode A transponder, RS-10 is reported to include both a Mode K and Mode T transponder. Mode K, previously used on an ISKRA satellite launched from Salyut, uses 15 meters up and produces a 10 meter downlink. Mode T is a new Mode not previously used in any oscar. It will use 15 meters up to produce a 2 meter downlink. A 2 meter beacon will be placed at 145.557 MHz while a 70 cm beacon's frequency remains undetermined pending licensing arrangements.

Meanwhile, reports are circulating that a Progress refueling mission to Salyut 7 in January will include ISKRA 4. ISKRA 4 was, like prior ISKRAs, built at the Moscow Aviation Institute. It will contain a Mode K transponder. Its 92 minute orbit will likely survive a month or two before re-entering. However, the launch of ISKRA-4 may be postponed due to the recent emergency return of the Cosmonauts to earth. One of the Cosmonauts aboard Salyut 7 became seriously ill last week and the entire three-man crew returned to the Soviet Union. Recovery was uneventful. The effect on missions next year is not established at this juncture.

Vail Meeting Summary

The Third Annual Space Symposium, the AMSAT Annual General Meeting and the Autumn Board of Directors' meeting took place the weekend of November 9 and 10 in snowy Vail, Colorado high in the Rocky Mountains.

The Space Symposium was Saturday. Speakers included W3IWI (SAREX-2 and packet radio linking); N6ARE and K8OCL (ARTOB balloon-borne transponder experiments);

WB6JNN (ACSSB and gateway links); N4HY (predicting AO-10 eclipses); JA2PKI et al (JAS-1); Richard Ensign (Young Astronaut Program); Bob Blackledge (L5 Society); DJ4ZC (Phase 3-D concept); KE3D (patch antennas); W3GEY (Phase 4 concepts); NK6K (PACSAT); W3GEY (Mode S). The technical presentations were followed by a question and answer session from the floor. The SAREX-2 proposal was formally handed over from AMSAT/ARRL to NASA at the Symposium.

Saturday evening the Annual Meeting began with a lively and entertaining introduction of all guests. About 100 *banquet* guests were on hand. President WA2LQQ presented his report to the members on the state of AMSAT. He reported AMSAT is solvent, growing and is vibrant with over a dozen technical and operations projects under way. He stated the key to future vitality was to broaden our appeal through accessible projects and information services.

The results of the Board of Directors' election were then announced. The results were reported as follows:

W3GEY	1310
W6SP	1103
VE2VQ	901
NK6K	786
KE3D	699
WA5ZIB	652
KG6LC	487
N6ARE	400

Total ballots cast: 1650. (Tallied by M. Saragovitz)

Awards were then given to nearly two dozen individuals. The key awards were made to:

W3IWI for his fundamental orbital tracking algorithms.
 DJ4ZC for his design and implementation of HELAPS.
 W3GEY for than a decade of technical leadership.
 Martha S. for outstanding dedication in member service.
 WB6JNN for technical innovation in developing ACSSB.
 N4IFD as the Outstanding Area Coordinator for 1985.
 Other awards went to: N3CHZ, W6XN, NK6K, WA5ZIB, WB8OTH, N6TE, W6WNK, N4HY, WB0GAI, WA6VGS, W0CY, W4BIW, W8PGP, W6KAG, WB6GFJ.

The banquet prizes were then awarded. Winner of the IC-1271A 24 cm transceiver Grand Prize was Art Feller, KB4ZJ. The Alinco 2 meter HT was won by W4DAQ. Over \$2,000 in prizes had been donated and were all claimed at the banquet.

On Sunday the Board met in an all-day session. Major actions of the Board included:

1. *Election of Officers:* W6SP, Chairman of the Board; M. Saragovitz Secretary to the Board; WA2LQQ, President; K8OCL, EVP; W3GEY, VP-Eng; N6ARE, VP-Ops; W3XO, VP-MSO; K9LF, VP-SP; WA2JTC, Publisher; KB4ZJ, Treas; M. Saragovitz, Dir. Admin. The concept of VP for member service was endorsed with discussions on assignee pending.

2. Declining to establish a Board of Trustees in favor of specific assignees and action officers.

3. Directing re-orientation of ASR-AMSAT relations.

4. Directing discussions with ARRL on ASJ.

5. Directing the 1986 AGM venue/time be fixed ASAP by the President.

6. Endorsing (again) an international AMSAT organization formed by the extant organizations coalescing on a self-governing, parity basis and moving to place AMSAT as a partner in the coalescence and to promoting a constitutional meeting ASAP.

7. Establishing specific study committees to study and report back within 6 months on the feasibility of a Phase 4 project.

8. Requiring that not less than 50% of member dues be allocated to space systems projects.

9. Endorsing the SAREX-2 as proposed by W3IWI.

10. Endorsing increased cooperation and the drafting of a Memorandum of Agreement between AMSAT and the L5 Society in areas of mutual interest and benefit.

11. Approving in principle the budget as drafted by KB4ZJ with refinements and discrepancies to be worked out ASAP.

12. Endorsing the need to reduce inactive Life Member liabilities as an economy move.

13. Endorsing support for an emerging launch and satellite construction capability in Brazil.

14. Directing specific awards to individuals for excellent work.

15. Applauding the JAS-1 team of JARL/JAMSAT/NASDA on a phenomenal effort.

QRP Emphasis Heard

AMSAT managers emphasize the need to keep AO-10 uplink transmit power levels as low as possible at all times. It is particularly irresponsible to clobber the satellite with high power when lower power levels suffice. It is poor form and not in keeping with the spirit of cooperation required in satellite use. Moreover, all users are reminded that Mondays, UTC, are QRP days, meaning that uplink power must not exceed 100 watts ERP. Please help spread the word on this important matter.

New Publication Announced

AMSAT has announced the immediate availability of a new publication aimed at both the beginner and experienced OSCAR 10 user. Titled the *AMSAT Phase III Satellite Operations Manual*, it explains in easily understood terms many of the intricacies of working OSCAR-10. The graphic presentations of the orbits and the definitions of terms are especially helpful. With over a dozen authors and editors, the manual has been published in conjunction with Project OSCAR. It is available now from AMSAT HQ for a \$15 donation. Write AMSAT, P.O. Box 27, Washington, DC 20044.

IARU Region 3 Meets in New Zealand

A meeting of IARU Region 3 has attracted IARU Officials from around the world to the South Pacific. IARU Secretary K1ZZ and ARRL President W4RA and others attended. A special greeting from ARRL International Affairs Vice President, W1RU, was carried on AO-10's beacon recently. It expressed the desire of IARU to preserve and conserve the recognized satellite bands as recognized by ITU and IARU.

Study Groups to Evaluate New Satellite Concepts

Concepts for the design and implementation of the next generation of OSCARs is the objective of several study committees now being formed. Over the next several months these groups, mandated by AMSAT Board of Directors resolution, will look at possible successors to the Phase 3 generation of long-lived, multi-transponder, Molniya orbit spacecraft.

There will be four committees considering various aspects of a new generation of satellites. One group will look at technical feasibility of the spacecraft itself, another will define user requirements and estimate future capabilities. A third group will look at regulatory and legal issues in connection with inter-regional and intra-regional matters such as third party agreements. The fourth group will establish fund raising and resource development methods.

The committees will work autonomously although cross-fertilization and consultation is obviously required for a coherent plan. Operating under the leadership of a chairperson, each committee will submit its report in six months with draft reports available for review at the 4 month mark.

Qualified individuals interested in working with this program should express that interest in writing to AMSAT President WA2LQQ at P.O. Box 177, Warwick, NY 10990. Committee members will be expected to write extensively, participate in meetings and be available for consultation. A word-processing system will be an advantage but is not mandatory. Expressions of interest should be forwarded ASAP but not later than 31 Dec. 85.

MARCE Date Set

The launch of the Marshall Amateur Radio Club Experiment (MARCE) has been scheduled for 1200 UTC on December 18 from Shuttle mission 61C according to MARCE Project Coordinator Ed Stluka, W4QAU. This will be a re-flight of a GAS can experiment which did not function on the first flight last year when a procedural error caused the activation of the experiment to be omitted.

Synthesized voice telemetry will report the conditions within the canister during the progress of several experiments. One part of the package is a crystal growing experiment while another will grow a radish seed.

The direct downlink frequency will be 435.033 MHz. Relay through AO-10 may be possible under very special conditions and all are encouraged to both predict these special

circumstances and to attempt to observe the retransmission of MARCE telemetry via AO-10 on Special Service Channel H1, nominally 145.972 MHz. Achievement of this telemetry relay would be seen as a major achievement in the history of Amateur Satellites. The direct downlink could be as strong as 6 watts ERP and should be easily heard. However, the downlink transmissions will occur in three relatively short episodes viewable mainly from the Southern Hemisphere but including Japan. For this reason, MARCE managers and AMSAT are soliciting telemetry capture assistance from Southern Hemisphere stations especially. Support from ZS, PY, VK and ZL has been evident but more help is needed. Contact N6ARE ASAP at 475 North Daisy Avenue, Pasadena, CA 91107. Or call 818-449-7088 to offer your assistance and to receive an informative data packet.

Group To Test SAREX-2 Software

By Ralph Wallio, WØRPK

Development of the next Shuttle Amateur Radio Experiment (SAREX-2) is underway. There is a possibility of its flying with Astronaut Ron Parise, WA4SIR, aboard the Space Shuttle Columbia in March 1986. The SAREX-2 station, potentially aboard STS-61E, will be on packet radio with several new and interesting modes of operation that require extensive "beta" testing.

The Central Iowa Technical Society (CITS) is preparing to provide intensive SAREX-2 ground-based and aeronautical mobile testing environments. Beginning with the availability of special TAPR TNC-2 SAREX-2 software on December 1, CITS members will operate a ground-based test in Des Moines, IA. Initial testing will peak during the weekend of December 6-8 when local packet radio stations will coordinate their operation to create as much load on the SAREX-2 software as can be mustered.

The following Wednesday evening, December 11th, CITS members Rich Amundson, WA0JFS, Ray Knapp, WA2GTM, and Larry Vandewater, NØBKB, will carry the SAREX-2 package aloft for an aeronautical mobile operation. They will "orbit" a Cessna 182 aircraft over Greenfield, IA at an altitude of 10,000 feet which should yield a 2M range of approximately 275 miles. This range will allow packet radio stations from as far away as Minneapolis-St. Paul, Chicago, St. Louis and Kansas City to help load test SAREX-2 software and a newly developed logging mechanism.

All ground-based and aeronautical testing will be held on 145.950 MHz uplink and 145.550 downlink. The aeronautical test will occur between 1900 and 2200 CST with a minimum of 2-hours at operational altitude. During the airborne test, WØRPK will chair a net on 3857 KHz to provide testing information. An ground-to-air UHF link will be maintained during the flight.

Should the December 11th operation be grounded due to weather, it will run on the following Wednesday, December 18th. Last minute information will be available on Tuesday evening AMSAT nets at 2000 and 2100 CST on 3857 KHz.

Orbit Predictions

By KA9Q

Satellite OSCAR-9
 Catalog number 12888
 Epoch time: 85318.13812672
 Thu Nov 14 03:18:54.148 1985 UTC
 Element set: 810
 Inclination: 97.6436 deg
 RA of node: 309.4105 deg
 Eccentricity: 0.0004245
 Arg of perigee: 98.5762 deg
 Mean anomaly: 261.5934 deg
 Mean motion: 15.27752411 rev/day
 Decay rate: 1.466e-05 rev/day²
 Epoch rev: 22812
 Semi major axis: 6857.635 km
 Anom period: 94.256110 min
 Apogee: 502.941 km
 Perigee: 497.119 km
 Ref perigee: 2874.15601913
 Thu Nov 14 03:44:40.52 1985 UTC
 Beacon: 145.8250 MHz

Satellite OSCAR-10
 Catalog number 14129
 Epoch time: 85314.71176120
 Sun Nov 10 17:04:56.167 1985 UTC
 Element set: 210
 Inclination: 26.2911 deg
 RA of node: 110.4506 deg
 Eccentricity: 0.5975505
 Arg of perigee: 60.3161 deg
 Mean anomaly: 345.9124 deg
 Mean motion: 2.05856627 rev/day
 Decay rate: -1.1e-07 rev/day²
 Epoch rev: 1815
 Semi major axis: 26105.417 km
 Anom period: 699.515979 min
 Apogee: 35329.744 km
 Perigee: 4131.134 km
 Ref perigee: 2870.73077065
 Sun Nov 10 17:32:18.584 1985 UTC
 Translate freq 581.0047 MHz
 Invert: 1
 Beacon: 145.8100 MHz

Satellite OSCAR-11
 Catalog number 14781
 Epoch time: 85307.60774287
 Sun Nov 3 14:35:08.983 1985 UTC
 Element set: 96
 Inclination: 98.1754 deg
 RA of node: 12.3807 deg
 Eccentricity: 0.0013983
 Arg of perigee: 145.3792 deg
 Mean anomaly: 214.8320 deg
 Mean motion: 14.62001729 rev/day
 Decay rate: 1.03e-06 rev/day²
 Epoch rev: 8940
 Semi major axis: 7061.932 km
 Anom period: 98.495096 min
 Apogee: 700.425 km
 Perigee: 680.676 km
 Ref perigee: 2863.63532454
 Sun Nov 3 15:14:52.39 1985 UTC
 Beacon: 145.8260 MHz

Satellite RS-5
 Catalog number 12999
 Epoch time: 85319.19504031
 Fri Nov 15 04:40:51.482 1985 UTC
 Element set: 276
 Inclination: 82.9594 deg
 RA of node: 222.8750 deg
 Eccentricity: 0.0009879
 Arg of perigee: 112.3285 deg
 Mean anomaly: 247.8832 deg
 Mean motion: 12.05053639 rev/day
 Decay rate: 4e-08 rev/day²
 Epoch rev: 17209
 Semi major axis: 8033.839 km
 Anom period: 119.496755 min
 Apogee: 1681.654 km
 Perigee: 1665.781 km
 Ref perigee: 2875.22088443
 Fri Nov 15 05:18:04.415 1985 UTC

Satellite RS-7
 Catalog number 13001
 Epoch time: 85310.26810587
 Wed Nov 6 06:26:04.347 1985 UTC
 Element set: 223
 Inclination: 82.9589 deg
 RA of node: 222.2098 deg
 Eccentricity: 0.0022987
 Arg of perigee: 62.1074 deg
 Mean anomaly: 298.2312 deg
 Mean motion: 12.08699530 rev/day
 Decay rate: 4e-08 rev/day²
 Epoch rev: 17153
 Semi major axis: 8017.665 km
 Anom period: 119.136308 min
 Apogee: 1674.404 km
 Perigee: 1637.544 km
 Ref perigee: 2866.28230129
 Wed Nov 6 06:46:30.831 1985 UTC

Satellite RS-8
 Catalog number 12998
 Epoch time: 85317.12071321
 Wed Nov 13 02:53:49.621 1985 UTC
 Element set: 346
 Inclination: 82.9610 deg
 RA of node: 227.0370 deg
 Eccentricity: 0.0018425
 Arg of perigee: 179.8646 deg
 Mean anomaly: 180.2418 deg
 Mean motion: 12.02954733 rev/day
 Decay rate: 3e-08 rev/day²
 Epoch rev: 17154
 Semi major axis: 8043.187 km
 Anom period: 119.705252 min
 Apogee: 1679.862 km
 Perigee: 1650.223 km
 Ref perigee: 2873.16222170
 Wed Nov 13 03:53:35.954 1985 UTC

Note that positive longitudes are degrees east; negative is west.

OSCAR-9
 Wed Nov 27 00:59:00.250 1985 UTC:
 Ascending node at -118.0
 Nodal period: 94.31403 min
 Longitude increment:
 23.575846 deg w/orbit
 Element set 810, epoch:
 Thu Nov 14 03:18:54.148 1985 UTC

Satellite NOAA-8
 Catalog number 13923
 Epoch time: 85306.13057229
 Sat Nov 2 03:08:01.445 1985 UTC
 Element set: 125
 Inclination: 98.6532 deg
 RA of node: 335.4894 deg
 Eccentricity: 0.0017597
 Arg of perigee: 40.0275 deg
 Mean anomaly: 320.2196 deg
 Mean motion: 14.22476506 rev/day
 Decay rate: 4.6e-07 rev/day²
 Epoch rev: 13497
 Semi major axis: 7192.279 km
 Anom period: 101.231900 min
 Apogee: 835.436 km
 Perigee: 810.123 km
 Ref perigee: 2862.13834051
 Sat Nov 2 03:19:12.620 1985 UTC

Satellite NOAA-9
 Catalog number 15427
 Epoch time: 85304.76155037
 Thu Oct 31 18:16:37.951 1985 UTC
 Element set: 44
 Inclination: 98.9641 deg
 RA of node: 258.2335 deg
 Eccentricity: 0.0016504
 Arg of perigee: 75.9676 deg
 Mean anomaly: 284.3328 deg
 Mean motion: 14.11387372 rev/day
 Decay rate: 9.8e-07 rev/day²
 Epoch rev: 4560
 Semi major axis: 7229.947 km
 Anom period: 102.027270 min
 Apogee: 883.374 km
 Perigee: 859.509 km
 Ref perigee: 2860.77644257
 Thu Oct 31 18:38:04.638 1985 UTC
 Beacon: 137.5000 MHz

OSCAR-11
 Wed Nov 27 00:20:28.540 1985 UTC:
 Ascending node at -35.4
 Nodal period: 98.55332 min
 Longitude increment:
 24.638017 deg w/orbit
 Element set 96, epoch:
 Sun Nov 3 14:35:08.983 1985 UTC
RS-5
 Wed Nov 27 01:36:58.801 1985 UTC:
 Ascending node at 126.3
 Nodal period: 119.55327 min
 Longitude increment:
 30.015293 deg w/orbit
 Element set 276, epoch:
 Fri Nov 15 04:40:51.482 1985 UTC
RS-7
 Wed Nov 27 01:03:26.360 1985 UTC:
 Ascending node at 129.1
 Nodal period: 119.19264 min
 Longitude increment:
 29.925072 deg w/orbit
 Element set 223, epoch:
 Wed Nov 6 06:26:04.347 1985 UTC
RS-8
 Wed Nov 27 00:14:04.369 1985 UTC:
 Ascending node at 150.1
 Nodal period: 119.76193 min
 Longitude increment:
 30.067484 deg w/orbit
 Element set 346, epoch:
 Wed Nov 13 02:53:49.621 1985 UTC

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